



# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>758.1588WOU1</b>	<b>FOR FURTHER ACTION</b>		See Form PCT/PEA/416
International application No. <b>PCT/US2004/031124</b>	International filing date (day/month/year) <b>23.09.2004</b>	Priority date (day/month/year) <b>17.10.2003</b>	
International Patent Classification (IPC) or national classification and IPC <b>F02M35/022</b>			
Applicant <b>DONALDSON COMPANY, INC.</b>			
<ol style="list-style-type: none"> <li>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</li> <li>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</li> <li>3. This report is also accompanied by ANNEXES, comprising:               <ol style="list-style-type: none"> <li>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 4 sheets, as follows:                   <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</li> <li><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</li> </ul> </li> <li>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</li> </ol> </li> </ol>			
<ol style="list-style-type: none"> <li>4. This report contains indications relating to the following items:               <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Box No. I Basis of the opinion</li> <li><input type="checkbox"/> Box No. II Priority</li> <li><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li><input type="checkbox"/> Box No. IV Lack of unity of invention</li> <li><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li><input type="checkbox"/> Box No. VI Certain documents cited</li> <li><input type="checkbox"/> Box No. VII Certain defects in the international application</li> <li><input type="checkbox"/> Box No. VIII Certain observations on the international application</li> </ul> </li> </ol>			
Date of submission of the demand  <b>16.08.2005</b>	Date of completion of this report  <b>13.01.2006</b>		
Name and mailing address of the international preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer  <b>Bogaerts, M</b>  Telephone No. +31 70 340-2335  		

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/US2004/031124

**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.  
  
☐ This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
  - ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

**Description, Pages**

1-27 as originally filed

**Claims, Numbers**

1-15 received on 16.08.2005 with letter of 16.08.2005

**Drawings, Sheets**

1/10-10/10 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
    - ☐ the description, pages
    - ☐ the claims, Nos.
    - ☐ the drawings, sheets/figs
    - ☐ the sequence listing (*specify*):
    - ☐ any table(s) related to sequence listing (*specify*):
  4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
    - ☐ the description, pages
    - ☐ the claims, Nos.
    - ☐ the drawings, sheets/figs
    - ☐ the sequence listing (*specify*):
    - ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

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Novelty (N)	Yes: Claims	1-15
	No: Claims	
Inventive step (IS)	Yes: Claims	1-14
	No: Claims	15
Industrial applicability (IA)	Yes: Claims	1-15
	No: Claims	

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

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**Re Item V:**

Reference is made to the following documents:

D1: GB-A-237895

D2: GB-A-752380

D3: US 6264712 B1

- 1.1 Document D1 is regarded as being the closest prior art to the subject-matter of claim 1 (page 1, line 10 - page 2, line 50).  
The subject-matter of claim 1 differs from D1 in that the vane(s) is/are configured to deflect from a first orientation to a second orientation in response to an increase in air flow rate through the precleaner, whereas in D1 the vanes are deflected by means of a mechanical connection with the carburettor in order to adjust the air flow rate through the precleaner.
- 1.2 The problem to be solved by the present invention may be regarded as the provision of a precleaner that is efficient at relatively low air flow rates, and exhibits limited flow restriction increases under higher air flow rate conditions.
- 1.3 Neither D2 nor D3 give an indication that would prompt the skilled person to amend the disclosure of D1 by using vanes that are deflected from one orientation to another in response to an increased air flow rate.
- 1.4 The subject-matter of claim 1 thus involves an inventive step (Article 33(3) PCT).
- 2.1 The same argumentation applies, mutatis mutandis, with respect to independent claims 12 and 14.
- 2.2 Claims 1-11 and 13 are dependent on respectively claim 1 and claim 12 and as such also meet the requirements of the PCT with respect to novelty and inventive step.
3. Document D2 (page 1, line 48 - page 2, line 31) discloses vanes which have a flexible portion, which may be made from a plastic, and a rigid portion. Moulding is one of the most common ways of manufacturing plastic products. Therefore, the

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subject-matter of claim 15 is not considered to involve an inventive step (Article 33(3) PCT). In this context it is submitted that the addition of features which do not relate to the method of manufacturing per se, cannot render the method inventive.

The relevant features are: "configured to deflect toward ..... arrangement of the precleaner".

What is claimed is:

1. A precleaner arrangement for separating a portion of entrained material from air flow air entering an engine air cleaner; the precleaner arrangement comprising:
  - (a) a vane structure arrangement including at least a first, adjustable, air deflection vane;
    - (i) the first, adjustable, air deflection vane having a flexible portion deflectable between a first orientation and a second orientation;
    - (ii) the flexible portion having a memory bias toward the first orientation; and,
    - (iii) the flexible portion being configured to deflect toward the second orientation, in response to a sufficient air flow rate increase through the precleaner arrangement, in use.
2. A precleaner arrangement according to claim 1 wherein:
  - (a) the vane structure arrangement comprises a plurality of adjustable air deflection vanes positioned around a central hub;
    - (i) each adjustable air deflection vane having a flexible portion deflectable between a first orientation and a second orientation;
    - (ii) each flexible portion having a memory bias toward a first orientation; and,
    - (iii) each flexible portion being configured to deflect toward the second orientation in response to a sufficient air flow rate increase through the precleaner arrangement, in use.
3. A precleaner arrangement according to claim 2 wherein:
  - (a) each adjustable air deflection vane comprises:
    - (i) a flexible member; and,
    - (ii) a rigid structural member.

4. A precleaner arrangement according to claim 3 wherein:
  - (a) the vane structure arrangement includes at least three adjustable air deflection vanes.
5. A precleaner arrangement according to claim 4 wherein:
  - (a) the vane structure has a first axial total vane length  $X$  and a first vane perimeter size  $Y$ ;
  - (b) the precleaner being configured such  $X < Y$ .
6. A precleaner arrangement according to claim 5 wherein:  
 $X < 0.7Y$
7. A precleaner arrangement according to claim 6 wherein:  
 $X < 0.3Y$
8. A precleaner arrangement according to claim 4 wherein:
  - (a) the vane structure includes a perimeter rim:
    - (i) each adjustable air deflection vane being secured in extension between the central hub and the perimeter rim; and
    - (ii) a perimeter edge portion of each flexible portion being spaced from the perimeter rim, to define a flexible, downstream, outer ear in the associated flexible portion.
9. A precleaner arrangement according to claim 8 wherein:
  - (a) each adjustable air deflection vane has: a lead, upstream, edge; and, a tail, downstream, edge; and
  - (b) the flexible member has a concave upstream surface in extension between the lead edge and the tail edge, when in the first orientation.
10. A precleaner arrangement according to claim 9 having:
  - (a) a projection angle  $A$  between the lead upstream edge of each adjustable air deflection vane and a tail edge of a next adjacent air deflection vane of at least  $17^\circ$ .

11. A precleaner arrangement according to claim 8 wherein:
- (a) the vane structure arrangement is secured to a perimeter housing structure having a dust drop tube.
12. An air cleaner comprising:
- (a) a precleaner arrangement comprising a vane structure arrangement including a plurality of adjustable, air deflection vanes;
    - (i) each adjustable air deflection vane having:
      - (A) a flexible member; and,
      - (b) a rigid structural member;
    - (ii) each flexible member being deflectable between a first orientation and a second orientation;
    - (iii) each flexible member having a memory bias toward the first orientation; and
    - (iv) the flexible member being configured to deflect toward the second orientation, in response to a sufficient air flow rate increase through the precleaner arrangement, in use; and
  - (b) a main air cleaner positioned to receive air from the precleaner arrangement;
    - (i) the main air cleaner having a serviceable air filter element therein.
13. An air cleaner arrangement according to claim 12 wherein:
- (a) the serviceable air filter element comprises z-filter media.
14. A method of operating a precleaner to separate a portion of entrained material from air flow entering an engine air cleaner; the method including steps of:
- (a) directing air through air deflection vanes of a vane structure of the precleaner at a first flow rate; and
  - (b) increasing air flow from the first flow rate to a second, higher, flow rate while adjusting configuration of selected vanes in the vane structure by deforming flexible portions of the vanes toward a downstream direction in response to the second, higher, flow rate.



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15. A method of manufacturing a vane structure arrangement of a precleaner; the method including steps of:
- (a) injecting a first material into a mold arrangement, to form a support structure; and,
  - (b) injecting a second moldable material, into contact with the first material, to form flexible vane portions configured to deflect toward a downstream direction in response to a sufficient air flow rate increase through the vane structure arrangement of the precleaner.

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